

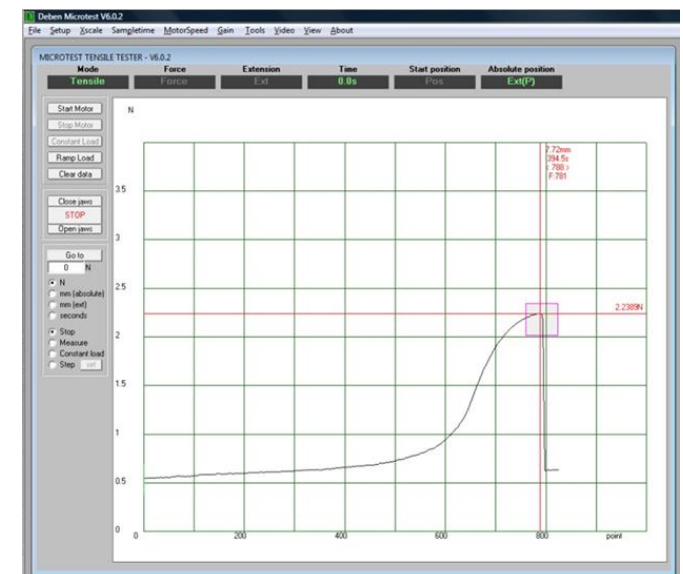
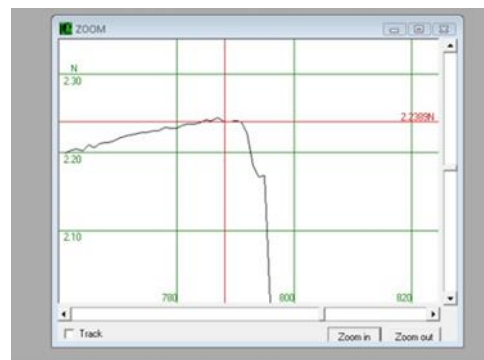
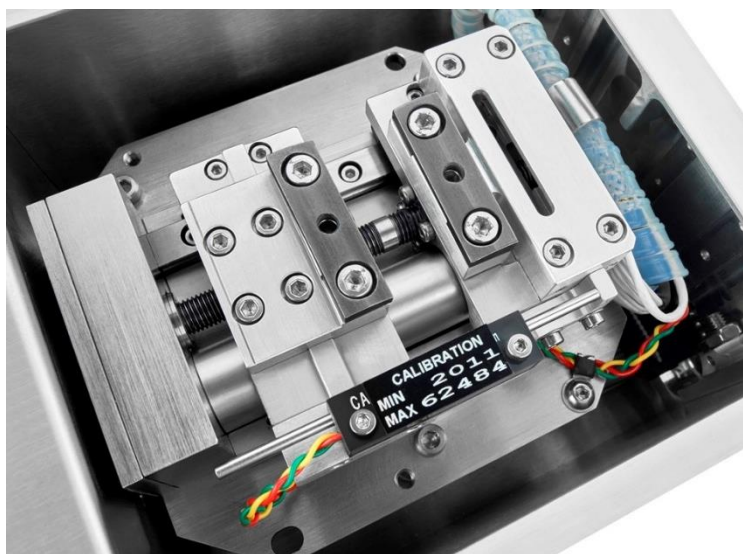
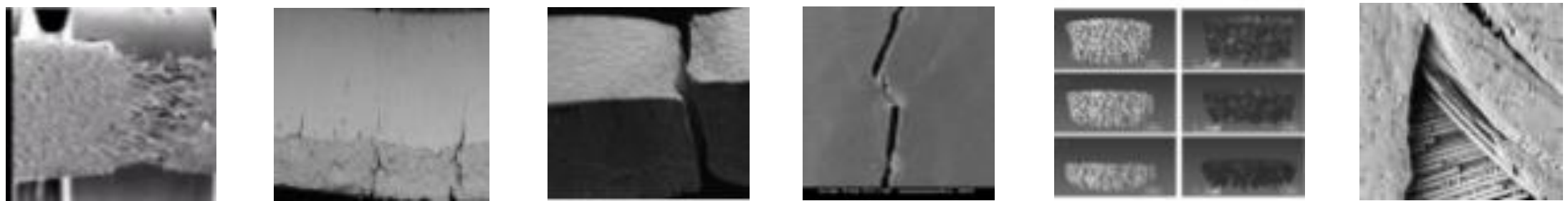
Tensile and Compression Stages

SEM - AFM - Optical - XRD - Synchrotron - XRM (μ XCT)

Traditional tensile testing provides information relating to the tensile and compressive strength of a material, but provides no insight into the physical changes to the internal structure whilst under load. There is a way around this, utilising In-Situ tensile testing and heating/cooling allows complex microstructural observation which can provide new insights with regards to materials research.

Deben systems are specifically design to compliment a variety of stages, such as SEM, Optical Microscopes, XRD, XRM (μ XCT) and beam line, most of which can be used on the bench-top (excluding XRM). All stages have the optional extra of three & four point bending clamps, which work with the systems comprehensive Windows software via USB.

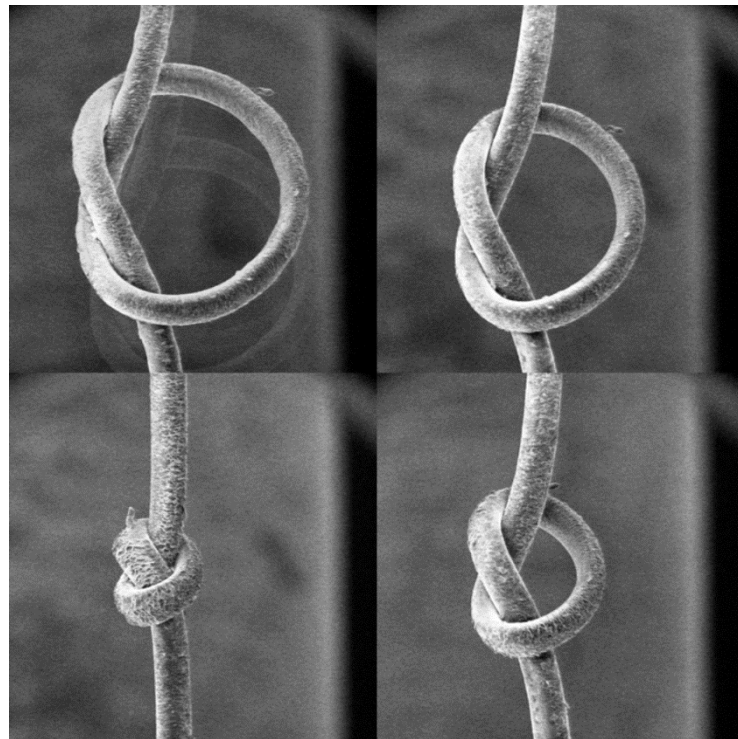
- Loadcells from mN to 20kN
- Tensile, compression, bending & torsion
- Heating & Cooling
- Software Controlled



Our stages have had many successful applications in areas such as: materials, polymers, composites, biological, life sciences, geology, foodstuffs and textiles. With exchangeable loadcells, heating, cooling and In-Liquid options, there is something to suit anyone, whatever their requirement. The picture above (left) shows a Deben Microtest tensile stage mounted in the Phenom XL desktop scanning electron

System Options

Stage	Max load	Exchangeable loadcells	Compatibility				System Options			
			SEM	Optical	XRD	XRM	Loadcell options	Heating	Cooling	In-Liquid
MT200	200N	✓	✓	✓	✓		2N,5N, 10N, 50N, 20N,200N	✓	✓	✓
MT300	300N	✓	✓	✓	✓		75N,150N,300N			
MT2000	2KN	✓	✓	✓	✓		660N,2kN	✓	✓	
MT5000	5KN	✓	✓	✓	✓		660N,2kN,5kN	✓	✓	
MT1000	1KN		✓	✓	✓		150N, 1kN			
MT2000DL	2KN	✓		✓	✓		200N,1kN,2kN	✓	✓	
MT5000DL	5KN	✓		✓	✓		200N, 1kN, 2kN, 5kN	✓	✓	
MT300B	300N	✓	✓	✓			75N,150N,300N			
MT2000B	2KN	✓	✓	✓			1kN			
MT2000ES	2KN		✓				1kN,2kN	✓	✓	
CT500	500N					✓	500N			
CT5000	5kN	✓				✓	1kN,2kN,5kN	✓	✓	✓
CT10KN	10kN/0.1kNm					✓	10kN/0.1kNm	✓	✓	✓
CT20KN	20kN/0.1kNm	✓				✓	(10kN,20kN)/0.1kNm	✓	✓	✓



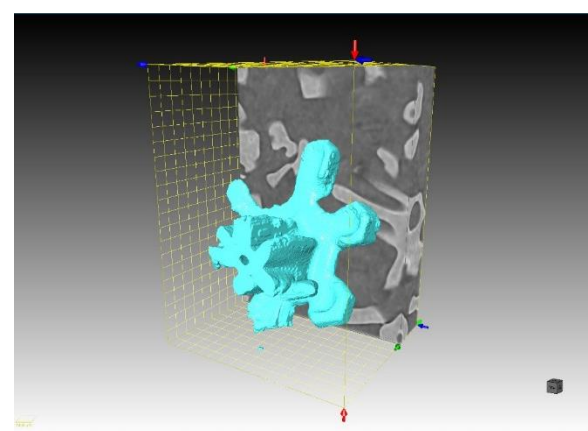
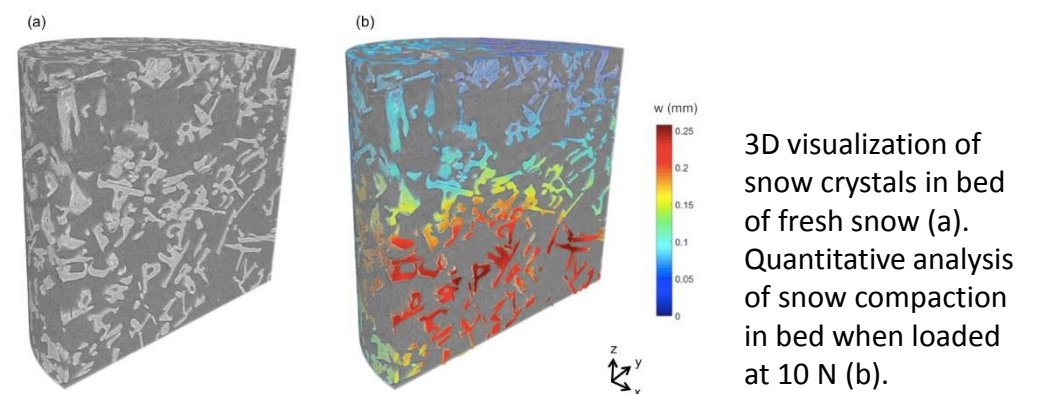
Hair sample imaged under tension in Phenom XL desktop SEM. Images: clockwise from top left

Tensile Stage for SEM

These images show results obtained with our Tensile Stage, in use with the Phenom XL desktop SEM. Karl Kersten, Manager of Applications Engineering at Phenom World describes our tensile stage: “The tensile stage from Deben is a robust device which is as easy to use as a Phenom desktop SEM. It can be loaded into the Phenom XL just like any other sample holder. There is no need to install or prepare any parts inside the SEM which really shortens the time to image. The tensile stage can be used outside the SEM under an optical device and inside the SEM when a higher magnification and better depth of focus is required. This bridges the gap between the light and electron microscopy worlds which could potentially expand the range of users.”

Tensile Stage for XRM (μ XCT)

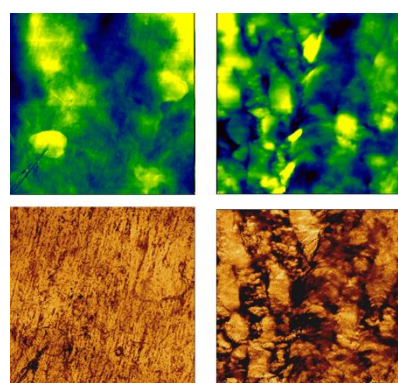
These images were obtained using the Deben CT5000TEC in-situ loading module, with a Zeiss Xradia 510 Versa. The team at Lulea University of Technology in Sweden made use of our accessory to acquire 3D data relating to their investigation of snow crystals and compaction. Dr Forsberg lead the team and was pleased with the performance of the CT5000TEC - “X-ray microtomography and the use of the Deben load stage with temperature control allows studies of snow crystal microstructure in a way that until recently has not been possible. Previously, we have mainly used test stages that we have built ourselves. However, none of these have had temperature control. A further great benefit in using the Deben stage is the flexibility in using different load cells which may be selected depending on material and application. Also, the software interface is easy to use and is supported by the Scout and Scan software from Zeiss that is used for control of the Versa.”



Snapshot from a video created by the team at Lulea, showing a 3D visualisation 'fly-through' of a snow crystal



Deben Microtest 200N tensile and compression stage in use with the Nano Wizard AFM system.



Tensile Stage for AFM

The Topographic (green) and stiffness (gold) images below show paraffin film, both before stretching (left) and after stretching to more than 3x the original length (right). Dr Torsten Mueller is a member of the development team at JPK Instruments, a nanoscience instrument maker based in Germany. Their main product is the NanoWizard AFM platform and due to user demand JPK needed to find a suitable micro stretching device. Dr Mueller explains the reasoning behind the choice of the the Deben Microtest 200N: “We decided to go with Deben for a number of reasons. Firstly, it allows us to work simultaneously with our tip-scanning AFM and simultaneous top view observation. Secondly, the bi-directional stretching operation means the centre region of the sample will stay in position related to the optical axes and the adjusted AFM cantilever. We also find the height and overall size of the stretching stage allows us to mount it on our base stage providing the flexibility either as a stand-alone system or to use on top of an optical microscope body. And not least, it comes at a fair price.”